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Chapter 5. Syntactic complexity and phonological expression in written L1 and L2 French¹

5.1 Introduction

It is well-known that inflectional morphology is difficult to acquire both in L1 and in L2 (e.g. Blom et al. 2008 for L1 and L2 Dutch; van der Velde 2003 for L1 French and Dutch; Bartning 2000 for L2 French). In contrast to lexical elements for instance, nominal and verbal inflections are prone to errors (e.g. Bartning 2000; Clahsen et al. 1993 for L1 German). In this respect, both the L1 and L2 acquisition of inflectional morphology is constrained by several linguistic factors, such as the syntactic complexity of the agreement construction (Moscati and Rizzi 2014 for L1; Ågren 2009 for L2) and the phonological expression of the inflection (Largy and Fayol 2001 for L1; Goldschneider & Dekeyser 2001 for L2). With respect to syntactic complexity, sentences hosted in a larger underlying syntactic structure are claimed to be more complex than those hosted in a smaller one. Within such a context, the length of the syntactic structure in terms of the total number of syntactic nodes by which it is built can be taken as a relevant measure of syntactic complexity (e.g. Roll et al. 2007; Hawkins 1994). Furthermore, the length of constituent movement in terms of the number of syntactic nodes intervening between the moved constituent and its original position can be considered as a second factor determining syntactic complexity.

Regarding the effect of syntactic complexity on the L1 acquisition of inflections, Moscati and Rizzi (2014) showed that less complex agreement constructions are acquired earlier than more complex ones. More precisely, in this study, determiner-noun constructions occurring in a small syntactic structure, were fully mastered before subject-verb and past participle agreement constructions, which occur in a larger syntactic structure. Furthermore, the results revealed that clitic-past participle constructions were mastered earlier than noun-past participle constructions. The latter is claimed to be hosted in a larger syntactic structure than clitic-past participle constructions. The authors claim that the effect of syntactic complexity on language acquisition can be related to the computational resources engaged in the cognitive system. More specifically, the length of the syntactic

1. This chapter has been prepared as a stand-alone journal paper that has been submitted to *Language Acquisition*. Therefore, sections 5.2-5.6 summarize the main findings discussed in the previous chapters of this dissertation.

structure of sentences is taken to be proportionally related to the processing costs of these sentences. Due to an increased amount of syntactic phrases in complex sentences, the processing accuracy for other language processes, such as producing inflections, decreases (see also Fanselow, Kliegl & Schlesewsky 1999). This leads to more errors in language production.

Besides the effect of syntactic complexity on L1 acquisition, the processing of inflectional morphology in L1 is also influenced by the phonological expression of the inflection. Frenck-Mestre et al. (2008) for instance, demonstrated that, in French, 'silent' inflections are processed more slowly than those which are phonologically expressed.

In this respect, the L2 acquisition of inflections seems to also be influenced by the syntactic complexity of agreement constructions. Ågren (2008) for instance, observed a gradual acquisition pattern of inflectional morphology in L2 French. More specifically, plural inflections in written L2 French show up first within the NP and after that, outside the NP. The observed pattern seems to correlate with the size of the syntactic domain which contains the agreement configuration.

As in the L1 acquisition of inflectional morphology, the phonological expression of the inflection morpheme also has an effect on L2 acquisition. Osterhout and colleagues (2008) for instance, conducted an ERP study in which they investigated the processing of plural inflections by English learners of L2 French. The authors found that inflections which were phonologically expressed, were acquired earlier than those which were 'silent'.

To date, the effect of syntactic complexity and the phonological expression of inflections has received little attention in both L1 and L2 research when it comes to written language.

In the present chapter I report an experiment investigating the effect of syntactic complexity and phonological expression of gender marking in written French. The participants consist of both monolingual native speakers of French and Dutch native speakers of French, who are learning French as a second language. The chapter is organized as follows: in section 2 and 3 I will present previous research on the effect of syntactic complexity on language production in L1 and L2 respectively. Section 4 and 5, then, will provide a state-of-the-art on the phonological expression of inflections and its effect on both L1 and L2 language production. In section 6 I will give an overview of the adjectival paradigms in Dutch and French. Section 7 presents the research question and the hypotheses to be tested in this study. Then, the results will be reported in section 8. In section 9, these results will be discussed and, finally, I will draw some conclusions based on these results in section 10.

5.2 Syntactic complexity and the L1 acquisition of inflections

As shown by Moscati and Rizzi (2014), the syntactic complexity of agreement configurations is claimed to influence the accuracy of inflectional morphology in L1 acquisition. Further evidence for this effect comes from the acquisition of past participle agreement. Moscati and Tedeschi (2009) for instance, argued that the delay of past participle agreement in young L1 learners of Italian can be related to a higher syntactic complexity (with respect to determiner-noun and subject-verb agreement). More precisely, past participle agreement is hosted in a larger syntactic domain than determiner-noun or subject-verb agreement constructions. The increased distance between the past participle and the object clitic implies that this type of agreement exhibits a higher syntactic complexity. As a consequence, syntactic movements are more demanding in terms of memory requirements and therefore, it slows down the acquisition process of inflections in these constructions.

To the best of my knowledge, however, only my own study presented in chapter 4, has tackled this issue in written language production. In this study, I tested monolingual native speakers of French ($n = 28$; age range: 14 – 15 years) in a fill-in-the-gap task. The test items were sentences controlled for three types of agreement configurations: noun-adjective agreement, past participle agreement with an object clitic and past participle agreement with a fronted noun. These test conditions represented different levels of syntactic complexity. Participants were asked to fill in the correct inflection morpheme. Finally, the accuracy rate per test condition was computed. The results show that adjectives were performed correctly more often than past participles. More precisely, noun-adjective constructions exhibited fewer writing errors than past participle agreement constructions with a fronted noun. However, no significant difference between noun-adjective constructions and past participle agreement constructions with an object clitic was observed.

The data of this study clearly show that the syntactic complexity of agreement constructions has an effect on the written accuracy of inflectional morphology in L1. More specifically, as argued in Moscati and Rizzi (2014), agreement constructions hosted in a larger syntactic structure might engage more computational efforts than those in a smaller functional domain. Therefore, more writing errors were found in past participle agreement constructions.

5.3 Syntactic complexity and the L2 acquisition of inflections

Syntactic complexity seems to also have an effect on the L2 acquisition of inflectional morphology. In *Processability Theory* (Pienemann 1989) for example, the

distance between agreeing elements in the sentence is taken to correlate with the pattern in which the agreement relations are processed.

With respect to written language production, not many studies have tackled this issue. To the best of my knowledge, only the studies by Ågren (2009, 2008) and my study reported on in chapter 4, focused on the effect of syntactic complexity on the written accuracy of grammatical inflections in L2.

Ågren (2009) for example, analyzed 30 texts written by advanced L2 learners of French, who were native speakers of Swedish, and 30 texts written by advanced L1 speakers of French. Focusing on nouns, personal pronouns, verbs and adjectives, the accuracy of number morphology was computed per lexical category. The results showed that the plural inflection on nouns was fully mastered in both L1 and L2 learners. Regarding adjectives, the author found that, in the native speakers, number marking on attributive adjectives showed correct inflections more often than on predicative ones. Contrastingly, this difference was not observed in the L2 learners.

The experiments reported on in chapter 4, however, revealed an effect of syntactic complexity on the accuracy of written inflections in L2. I tested Dutch learners of French ($n = 26$; age range: 17 – 18 years) in the same experimental task as for the L1 speakers, described in the previous section. The results revealed that noun-adjective constructions yielded fewer writing errors than past participle agreement constructions with an object clitic. The reason for this can be sought in the fact that noun-adjective constructions are less complex, based on the distance between the noun and the adjective. As a consequence, the processing of this construction might engage fewer computational resources than past participle constructions.

Furthermore, the past participle agreement constructions with an object clitic exhibited fewer writing errors than past participle agreement constructions with a fronted noun. As past participle agreement with an object clitic is claimed to take place in a smaller syntactic domain than past participle agreement with a fronted noun (e.g. Kayne 1994), the latter might be cognitively more demanding. Therefore, more writing errors were found in participle agreement constructions with a fronted noun.

These results, thus, showed that the effect of syntactic complexity on written grammatical inflections also holds for L2 acquisition.

5.4 Phonological expression and the L1 acquisition of inflections

Besides the effect of syntactic complexity on the acquisition of inflectional morphology, the phonological expression of inflections seems to also influence the acquisition process. More precisely, phonologically expressed inflections are pro-

cessed faster than covert ones (e.g. Frenck-Mestre et al. 2008; Schiller et al. 2003). The difficulty in the acquisition of ‘silent’ inflections also affects the accuracy of inflectional morphology in written language production, as can be observed in the ‘phonological spelling’ by young L1 learners of French (Largy and Fayol 2001). This observation can be explained by the fact that young children are only exposed to their native language in the spoken modality. These native speakers have to call upon morphological rules when they write in languages exhibiting ‘silent’ inflections, as in French. In such languages, L1 learners cannot simply rely on phonological cues. In French, the masculine adjective *joli* /ʒoli/ ‘smart’, for example, is not phonologically distinct with respect to the feminine counterpart *jolie* /ʒoli/. The feminine gender marking in French may (but must not) be phonologically expressed.

In this respect, Sénéchal (2000) tested native speakers of French in grade 2 ($n = 57$; mean age: 7.5 years) and in grade 4 ($n = 55$; mean age: 9.6 years). The participants were asked to spell regular, morphological and deep words. The regular ones were words in which every phoneme is represented by one single grapheme (e.g. *joli*). Morphological words were those in which ‘silent’ endings could be detected by means of morphologically related words (e.g. *savon* ‘soap’ is related to the denominal verb *savonner* ‘to soap’). Finally, the deep words were words in which the ‘silent’ ending cannot be detected by means of morphologically related words, as in *noeud* ‘button’. The author demonstrated that writers make more writing errors in morphological and deep words than in regular words. Furthermore, more errors were observed in deep words than in morphological words. These results, thus, showed that words with ‘silent’ endings are written correctly less often than those with phonologically expressed endings.

5.5 Phonological expression and the L2 acquisition of inflections

The phonological expression of inflections seems to also have an effect on the acquisition of inflectional morphology in L2. Goldschneider and Dekeyser (2001) for instance, found that the phonological salience of inflection morphemes is one of several factors jointly influencing the acquisition of inflectional morphology in oral language. More precisely, a phonologically expressed inflection is acquired earlier than a covert one, because of the fact that the first one is more salient. Interestingly, this effect seems not to influence the written production of inflections in L2. Besides the effect of syntactic complexity on written French, Ågren (2009) also focused on the effect of phonological expression on the accuracy of written inflections. She found more incorrect number inflections in personal pronouns and verbs in the native speakers’ texts than in the texts written by L2 learners. More specifically, the ‘silent’ number inflection was omitted more often in

the production by L1 speakers than in the production by L2 learners (e.g. *il* ‘he’ vs. *ils* ‘they’). The author argued that the lack of the phonological expression of the number morpheme negatively influences the accuracy of number inflections in written L1 French, but not in L2 French. However, in the native speakers’ texts, fewer writing errors were observed in number morphology with adjectives than in the written production by L2 learners. Differences between the lexical categories suggest that, in both L1 and L2 French, the phonological expression of the inflection seems to be a post hoc effect with respect to other linguistic factors, such as the lexical category. Furthermore, these results suggest that phonological expression interacts with other linguistic factors which manifests itself differently in L1 vs. L2 French.

5.6 Gender marking on adjectives and past participles in French and Dutch

This study will use French gender marking to investigate the effect of syntactic complexity and phonological expression on written language production. For that purpose, I will present the paradigms of gender marking in French and Dutch. Specifically, I will focus on adjectives and past participles in both attributive and predicative constructions. I will also show how gender marking in these constructions is expressed in both languages.

5.6.1 Gender marking in French

In French, the gender system distinguishes between masculine and feminine. The masculine gender selects the definite article *le* and the indefinite article *un*, as in (1a), while the feminine gender selects *la* as its definite article and *une* as its indefinite article, as in (1b). With respect to gender marking in noun-adjective constructions, the adjective agrees in gender with the noun. More specifically, in a masculine context, noun-adjective agreement is not overtly expressed on the adjective in both written and spoken language (see (1a)). In a feminine context, however, gender is overtly reflected on the adjective by the inflection *-e* in written language. Contrastingly, this gender inflection is not overtly expressed in spoken language (see (1b)).

- (1a) Le / Un joliø cadeau /ʒoli/
 The-M.S. / A-M.S. nice-M.S. present-M.S.
 ‘The / A nice present’

- (1b) La / Une jolie voiture /ʒoli/
 The-F.S. / A-F.S. nice-F.S. car-F.S.
 ‘The / A nice car’

In adjectives ending in a consonant, however, the feminine gender marking is expressed in both written and spoken language (see (2)).

- (2a) Le / Un grand**ø** cadeau /grã/
 The-M.S. / A-M.S. big-M.S. present-M.S.
 ‘The / A big present’

- (2b) La / Une grande voiture /grãd/
 The-F.S. / A-F.S. big-F.S. car-F.S.
 ‘The / A big car’

In the same way as gender marking on adjectives in attributive constructions, adjectives in predicative constructions also express gender marking (see (3)).

- (3a) Le / Un cadeau est joli**ø** /ʒoli/
 The-M.S. / A-M.S. present-M.S. is nice-M.S.
 ‘The / A present is nice’

- (3b) La / Une voiture est jolie /ʒoli/
 The-F.S. / A-F.S. car-F.S. is nice-F.S.
 ‘The / A nice car’

- (3c) Le / Un cadeau est grand**ø** /grã/
 The-M.S. / A-M.S. present-M.S. is big-M.S.
 ‘The / A present is big’

- (3d) La / Une voiture est grande /grãd/
 The-F.S. / A-F.S. car-F.S. is big-F.S.
 ‘The / A car is big’

Structural differences between attributive and predicative adjectives constructions can also be observed. More specifically, Kayne (1994) argues that predicative adjectives originate in a small clause in which the noun and the adjective are hosted (see (4)).

- (4) $_{CP}[_{IP} \text{ la voiture}_i [_{VP} [_V \text{ est } [_{XP} [_{DP} [t_i] [_{AP} [\text{grande}]]]]]]]$
 ‘La voiture est grande’

In (4) the copula of the predicative construction selects a small clause (i.e. XP) which contains the noun and the adjective. Since the noun c-commands the adjective, the unvalued gender feature of the adjective is valued against the valued counterpart on the noun (see e.g. Zeijlstra 2010). Finally, the noun moves to [spec,IP], which gives rise to the predicative construction.

In attributive constructions, the attributive adjective is claimed to be adjoined to a functional projection (e.g. XP) lower than DP in Romance languages (Schoorlemmer 2009):

- (5) $DP\ la_{[XP\ grande_{[XP[NP\ voiture]]}]}$
 ‘La grande voiture’

Based on this analysis, the attributive adjective can be considered as less complex as compared to the predicative one. More precisely, the size of the syntactic domain hosting the adjective and the noun is smaller than that in which predicative adjectives are hosted. Furthermore, there are no constituent movements in contrast to predicative adjectives.

In the same way as gender marking on adjectives, past participles in attributive and passive constructions also show gender marking in French (see (5) for the attributive use and (6) for the predicative use in passive constructions).

- (5a) Le / Un message reçuø /rəsy/
 The-M.S. / A-M.S. message-M.S. received-M.S.
 ‘The / A received message’

- (5b) La / Une lettre reçue /rəsy/
 The-F.S. / A-F.S. letter-F.S. received-F.S.
 ‘The / A received letter’

- (5c) La / Une lettre écrite /ecrit/
 The-F.S. / A-F.S. letter-F.S. written-F.S.
 ‘The / A written letter’

- (6a) Le / Un message est reçuø /rəsy/
 The-M.S. / A-M.S. message-M.S. is received-M.S.
 (par cet homme)
 (by this man)
 ‘The / A message is received (by this man)’

- (6b) La / Une lettre est reçue /rəsy/
 The-F.S. / A-F.S. letter-F.S. is received-F.S.
 (par cet homme)
 (by this man)
 ‘The / A letter is received (by this man)’

- (6c) La / Une lettre est écrite /ecrit/
 The-F.S. / A-F.S. letter-F.S. is written-F.S.
 (par cet homme)
 (by this man)
 ‘The / A letter is written (by this man)’

While the linear distance between the noun and the past participle differs in attributive and passive constructions, the structural distance is assumed to be equal. That is that attributive past participles can be taken as reduced relative clauses (Kayne 1994). More precisely, reduced relative clauses are hosted in the same syntactic structure as ‘complete’ relative clauses, but without the auxiliary and the subject of the verb (see (7) for French).

- (7) $[_{DP} La[_{CP} lettre_i[_{TP}[_{PastPartP} t_i[_{PastPart} écrite_j[_{VP}[_V t_j[_{NP} t_i]]]]]]]$
 ‘La lettre écrite’

As in ‘complete’ relative clauses, the direct object moves from NP to the specifier of PastPartP in order to value the unvalued gender feature of the past participle. The noun, then, moves further to the [Spec,CP] position.

With respect to passive constructions, the NP also raises from the complement position of the verb to a higher position in the clause (Baker, Johnson & Roberts 1989):

- (8) $[_{IP} NP_i[_I e[_{VP}[_V (v) + -en[_{NP} t_i]]]]]$

However, this analysis is based on passive constructions in English. As English does not exhibit overtly expressed past participle agreement, my assumption is that passive constructions in French contain the PastPartP projection to account for past participle agreement in passives. Based on the construction of reduced relative clauses, I assume that the structure of past participle agreement in passive constructions in French is as in (9).

- (9) $[_{CP}[_{TP} La lettre_i[_{AuxP} est[_{PastPartP} t_i[_{PastPart} écrite_j[_{VP}[_V t_j[_{DP} t_i]]]]]]]]]$
 ‘La lettre est écrite’

In (9) the noun moves from the DP to the specifier of PastPartP to value the unvalued gender feature of the past participle. Then, the noun raises further to the [Spec,TP] position. In terms of the number of syntactic nodes intervening between the noun and the past participle, one can clearly observe that the size of the syntactic domain of both types of past participle constructions is similar. The same holds for the length of constituent movement: the number of syntactic nodes between the final landing site of the noun and its original position is also similar in both types of past participle constructions.

Based on the working definition of syntactic complexity given in section 2.1, the above mentioned agreement constructions can be ranked with respect to the size of the syntactic domain in terms of the number of syntactic nodes by which it is composed and the length of constituent movement in terms of the number of syntactic nodes between the moved constituent and its original position. In table 1 these constructions are ranked in a particular level of syntactic complexity. Level 1 represents the least complex construction and level 3 the most complex one.

Table 1. Syntactic complexity: ranking adjective and past participle constructions in French

Rank	Size of syntactic domain quantified in terms of the number of intervening nodes between noun and adjective/past participle in the surface structure	Length of constituent movement quantified in terms of the number of intervening nodes between moved noun and its original position	construction
1	0	0	'La grande voiture'
2	1	1	'La voiture est grande'
3	1	3	'La lettre écrite'
	1	3	'La lettre est écrite'

As an ad interim conclusion, I may thus conclude that attributive adjectives are the least complex constructions whereas the attributive and passive past participle are the most complex. Despite the fact that predicative adjectives are hosted in a syntactic domain exhibiting the same size as that in which attributive and passive past participles are hosted, the size of the domain in which constituent movement has taken place in the attributive and passive past participle construction, is larger than in predicative adjectives. As such, predicative adjectives can be taken as less complex.

5.6.2 Gender marking in Dutch

The gender system in Dutch is a twofold system: neuter and non-neuter (henceforth *ntr* and *nntr* respectively) (Corver & van Koppen 2009). The neuter gender

selects the definite article *het* (e.g. *het huis* ‘the-*ntr* house-*ntr*’), while the non-neuter gender selects the definite article *de* (e.g. *de auto* ‘the-*nntr* car-*nntr*’). The indefinite article, however, is *een* in both neuter and non-neuter contexts (e.g. *een huis* ‘a-*ntr* house-*ntr*’ and *een auto* ‘a-*nntr* car-*nntr*’).

With respect to noun-adjective agreement, the attributive adjective in a definite context is always inflected by *-e* in both written and spoken language, regardless of the gender (see (10a) for neuter and (10b) for non-neuter)

- (10a) Het kleine huis /kleinə/
 The-*ntr* little-*suffix* house-*ntr*
 ‘The little house’

- (10b) De groene auto /grunə/
 The-*nntr* green-*suffix* car-*nntr*
 ‘The green car’

Contrastingly, in an indefinite context, the adjective does not show overt inflections in the neuter gender (see (11a)), while overt inflection on the adjective is present in the non-neuter gender (see (11b)).

- (11a) Een klein∅ huis /klein/
 A-*ntr* little-∅ house-*ntr*
 ‘A little house’

- (11b) Een groene auto /grunə/
 A-*nntr* green-*suffix* car-*nntr*
 ‘A green car’

In contrast to attributive contexts, the adjective never exhibits overt inflection in predicative contexts (see (12)).

- (12a) Het / Een huis is klein∅ /klein/
 The-*ntr* / A-*ntr* house-*ntr* is little-∅
 ‘The / A house is little’

- (12b) De / Een auto is groen∅ /grun/
 The-*nntr* / A-*nntr* car-*nntr* is green-∅
 ‘The / A car is green’

With respect to past participle agreement in Dutch, past participles in attributive constructions, which end in *-d*, behave similarly to adjectives in these constructions, as shown in (13).

- (13a) De / Een geopende auto /ɣəopəndə/
 The-*nntr* / A-*nntr* opened-*suffix* car-*nntr*
 ‘The / A car which has been opened’

- (13b) Een geopendø huis /ɣəopənt/
 A-*ntr* opened-ø house-*ntr*
 ‘A house which has been opened’

- (13c) Het geopende huis /ɣəopəndə/
 The-*ntr* opened-*suffix* house-*ntr*
 ‘The house which has been opened’

Past participles ending in *-en* never exhibit overt inflections in either written or spoken language (see (14)).

- (14) De / Een geslotenø auto /ɣəslotən/
 The-*nntr*/ A-*nntr* locked-ø car-*nntr*
 ‘The/ A car which has been locked’

In passive contexts, both past participles ending in *-d* and *-en* do not exhibit overtly expressed inflections in both written and spoken language (see (15)).

- (15a) De / Een auto is geopendø /ɣəopənt/
 The-*nntr* / A-*nntr* car-*nntr* is opened-ø
 (door de monteur)
 (by the mechanic)
 ‘The/ A car has been opened (by the mechanic)’

- (15b) Het / Een huis is geopendø /ɣəopənt/
 The-*ntr* / A-*ntr* house-*ntr* is opened-ø
 (door de politie)
 (by the police)
 ‘The/ A house has been opened (by the police)’

(15c) De / Een auto is geslotenØ /ɣəslotən/
 The-*nntr* / A-*nntr* car-*nntr* is locked-Ø
 (door de monteur)
 (by the mechanic)
 ‘The / A car has been locked (by the mechanic)’

(15d) Het / Een huis is geslotenØ /ɣəslotən/
 The-*ntr* / A-*ntr* house-*ntr* is locked-Ø
 (door de politie)
 (by the police)
 ‘The / A house has been locked (by the police)’

5.7 The research question and hypotheses

In this study I focus on gender marking in adjectives and past participles in L1 and L2 French. Specifically, I will investigate the effect of syntactic complexity and phonological expression on the written production of these two lexical categories. I will address the following research question:

Do syntactic complexity and overt phonological expression of morphology have an effect on the accuracy of gender marking in written L1 and L2 French?

I hypothesize that:

- i) in both L1 and L2 learners, adjectives exhibit fewer writing errors than past participles,
- ii) attributive adjectives exhibit fewer writing errors than predicative ones,
- iii) attributive past participles do not show differences in written accuracy with respect to past participles in a predicate, and that
- iv) in L1 learners, overtly expressed inflections exhibit fewer writing errors than covert ones, and
- v) in L2 learners, overtly expressed inflections and covert ones do not show differences in written accuracy.

The rationale behind the hypotheses ii and iii can be found in the fact that the agreement constructions under investigation in this study, represent different levels of syntactic complexity. More precisely, the size of the syntactic domain in which the agreement constructions are hosted in the surface structure, is expected to be related to the difficulty in written language production.

5.8 The experiment

In order to test the hypotheses, I presented a fill-in-the-gap task to monolingual speakers of French and L2 learners of French, who were native speakers of Dutch. The task consisted of test items which were controlled for two lexical categories, attributive vs. predicative position and phonological expression of gender marking (overt vs. covert). I report the details of the experiment in the next sections.

5.8.1 Method

5.8.1.1 Participants

The L1 participants of this experiment were monolingual native speakers of French ($n = 40$) living in Southern-Belgium. The L2 participants were native speakers of Dutch ($n = 45$) from the west of the Netherlands and attended courses in French language for 5 years at the highest level of the Dutch secondary school system (i.e. *voorbereidend wetenschappelijk onderwijs* ‘academic university preparatory education’). In each group, the age range was 17 – 18 years. Both the L1 and L2 participants had to confirm that he/she had no known language disorder, such as dyslexia. Moreover, the L1 participants had to also confirm that their home language was French. Furthermore, each participant (and one of the parents, in case of a minor) gave written informed consent for the experiment.

5.8.1.2 Materials

The materials consisted in a fill-in-the-gap task by which the participants’ accuracy of written gender marking in French was tested. More precisely, the task consisted of 160 test items which were controlled for two lexical categories (i.e. adjective and past participle), two levels of syntactic complexity (i.e. attributive and predicative constructions) and two levels of phonological expression (i.e. the presence (henceforth: [+phon]) and the lack (henceforth: [-phon]) of the phonological expression of gender marking). Here, attributive and predicative adjective constructions are taken to represent different levels of syntactic complexity, while attributive past participles constructions and past participles in a predicate are taken to represent an equal level of syntactic complexity.

Each test condition contained 20 test items in which the target items were only regularly inflected for gender and non-derived (e.g. *grand* ‘big’, *seul* ‘only’, *ouvert* ‘open’ and *reçu* ‘received’). Therefore, forms exhibiting stem alternations (e.g. *beau*-M.S. vs. *belle*-F.S. ‘beautiful’) or those derived from other lexical categories (e.g. *menteur*-M.S. vs. *menteuse*-F.S. ‘lying’) were not included in this experiment.

Furthermore, the test items were all in a feminine singular context. The reason for this can be sought in the fact that in French, masculine contexts do not trigger overt gender marking on regularly inflected non-derived adjectives and past par-

ticiples. As such, in masculine contexts, it is not possible to verify whether the participant makes the correct agreement between the noun, the element bearing valued lexical and grammatical features, and the adjective/past participle, the agreeing element. Additionally, the gender of the noun was overtly expressed in each test item, so that the participant had not to call upon his/her lexical knowledge with respect to lexical gender.

The test items also consisted of approximately the same number of words and the target item was in a non-final position in the sentence. Moreover, the target items were all highly frequent words (cf. Brunet 2014).

To verify whether the participants were able to comply with the task requirements, 40 filler items were added. These filler items were related to other grammatical issues than gender agreement (e.g. relative pronouns, partitive articles or verbal inflections).

Four French-speaking adult informants first checked the test items in order to be sure that none of them had an ambiguous interpretation. In (16) – (23), I will present some examples of the test items.

(16) **attributive adjective [+phon]**

Il pensait que la grand__ chienne
 He thought that the-F.S. big-F.S. dog-F.S.
 est restée dans le hall.
 is stayed in the hall
 ‘He thought (that) the big dog stayed in the hall’

(17) **attributive adjective [-phon]**

Elle était la seul__ actrice qui
 She was the-F.S. only-F.S. actrice-F.S. who
 voulait venir.
 wanted (to) come by
 ‘She was the only actrice who wanted to come by’

(18) **predicative adjective [+phon]**

Ma valise était lourd__, parce quej’
 My-F.S. suitcase-F.S. was heavy-F.S. because I
 ai pris plein de choses.
 have taken a lot of stuff
 ‘My suitcase was heavy, because I took a lot of stuff (with me)’

(19) **predicative adjective [-phon]**

Cette question est dur à résoudre
This-F.S. question-F.S. is hard-F.S. to solve

en deux heures.
within two hours

‘This question is hard to solve within two hours’

(20) **attributive past participle [+phon]**

Heureusement la fenêtre ouvert a
Luckily the-F.S. window-F.S. opened-F.S. has

été fermée.
been closed

‘Luckily the open window has been closed’

(21) **attributive past participle [-phon]**

La note reçu est à payer
The-F.S. bill-F.S. received-F.S. is to pay

en huit jours.
within eight days

‘The received bill must be paid within eight days’

(22) **past participle in a predicate [+phon]**

Sa femme est mort il y a
His-F.S. wife-F.S. is passed away-F.S. ago

quelques années.
several years

‘His wife has passed away several years ago’

(23) **past participle in a predicate [-phon]**

Heureusement ma maison sera vendu
Fortunately my-F.S. house-F.S. will be sold-F.S.

avant la fin de ce mois.
before the end of this month

‘Fortunately my house will be sold by the end of this month’

5.8.1.3 Procedure

The experiment was carried out in a class room setting at a secondary school in the Walloon region of Belgium (L1) and in the west of the Netherlands (L2). The participants of each group were in the same class room and were asked to take a seat in front of a computer screen. After having logged in, each test item was presented separately on the computer screen and was time limited for 15 seconds. The participant had to choose between four potential answers (i.e. masculine singular/plural and feminine singular/plural) and flag the target item which he/she deemed as correctly inflected. After 50 test items, a cartoon or a short video popped up on the screen as a one-minute break. Furthermore, the presentation order of the test items was counterbalanced for each participant. The task was done individually and under supervision of a teacher.

5.8.2 Results

I computed the accuracy rate of each test condition, which was expressed in terms of the percentage of correct responses per condition. A mixed-ANOVA was conducted in which there were three independent variables: Syntactic Complexity, Lexical Category and Phonological Expression. Each independent variable contained two test conditions. More precisely, Syntactic Complexity contained the attributive vs. predicative position of the target item, Lexical Category contained adjective vs. past participle and Phonological Expression contained the presence vs. the lack of the phonological expression of gender marking. Furthermore, the dependent variable was the accuracy rate of each test condition and the between-factor was the native speakers' group (group 1) vs. the L2 learners' group (group 2).

Post-hoc tests with Bonferroni correction were conducted to analyze the contrasts between the test conditions. For all statistical analyses the α level of significance was set at .05. An overview of the overall results is given in table 2 and figure 1.

Table 2: Means and standard deviations of the percentage of correct responses per category

Test condition	Group 1		Group 2	
	Mean	SD	Mean	SD
Attr Adj [+phon]	98.63	2.77	94.22	4.12
Attr Adj [-phon]	98.00	3.89	88.89	9.23
Attr Part [+phon]	95.50	5.16	80.78	11.38
Attr Part [-phon]	99.13	2.23	78.33	15.56
Pred Adj [+phon]	99.13	2.97	81.22	11.24
Pred Adj [-phon]	96.88	4.19	83.89	13.00
Pred Part [+phon]	95.25	4.52	72.56	19.88
Pred Part [-phon]	99.00	2.82	78.33	14.96

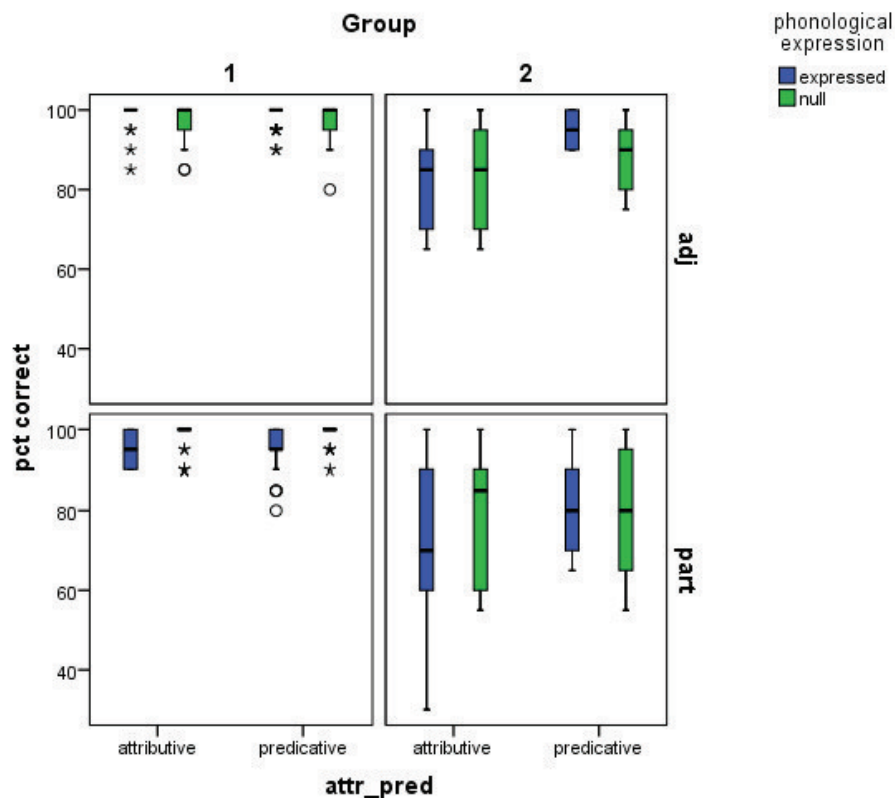


Figure 1: Overview of the overall results in %. On the vertical axis, the percentage of correct scores is given. Group 1 represents the native language users, whereas group 2 stands for the second language learners. For both groups, the results on the attributive and predicative conditions are presented in a separate box-and-whiskers for phonological expressed (blue) and phonologically silent (green) gender marking.

The results show a significant main effect for Syntactic Complexity ($F(1,83) = 31.83$; $p = .000$; $\omega^2 = .28$). Contrasts reveal that target items in an attributive position were performed better than those in a predicative position.

There was also a main effect for Lexical Category ($F(1,83) = 70.06$; $p = .000$; $\omega^2 = .46$). Here, contrasts reveal that adjectives were performed better than past participles. Finally, a significant effect for Group was observed ($F(1,83) = 85.32$; $p = .000$; $\omega^2 = .51$). Contrasts reveal that native speakers of French performed better in gender marking than L2 learners of French.

Phonological Expression, however, did not reach significance ($F(1,83) = 1.82$; $p = .181$; $\omega^2 = .02$). This indicates that the accuracy rates of phonologically expressed gender marking vs. 'silent' gender marking were similar in written inflectional morphology.

Furthermore, a two-way interaction between Syntactic Complexity and Group was observed ($F(1.83) = 27.33$; $p = .000$; $\omega^2 = .25$). This effect indicates that the accuracy rate of attributive and predicative target items differed in native speakers and L2 learners. More precisely, both attributive and predicative target items were performed better in native speakers than in L2 learners. There was also a two-way interaction between Lexical Category and Group ($F(1.83) = 47.62$; $p = .000$; $\omega^2 = .36$), indicating that both adjectives and past participles were performed better in native speakers than in L2 learners. More surprisingly, an interaction between Syntactic Complexity and Lexical Category was observed ($F(1.83) = 6.96$; $p = .010$; $\omega^2 = .08$). This effect reveals that the accuracy rate of both attributive and predicative target items differed in adjectives and past participles. More specifically, attributive adjectives were performed better than predicative ones and attributive past participles. Furthermore, attributive past participles triggered fewer errors than past participles in a predicate and predicative adjectives triggered fewer errors than past participles in a predicate. In this respect, the data also reveal a three-way interaction Syntactic Complexity x Lexical Category x Group ($F(1.83) = 6.28$; $p = .014$; $\omega^2 = .07$). More precisely, both past participles and adjectives in attributive and predicative positions were performed better in native speakers than in L2 learners. However, in L2 learners, the contrast in accuracy scores between attributive and predicative constructions is larger in adjectives than in past participles. In native speakers, a similar contrast was observed, but this contrast was smaller than in L2 learners.

With respect to Phonological Expression, a two-way interaction was found with Syntactic Complexity ($F(1.83) = 15.57$; $p = .000$; $\omega^2 = .16$). This interaction indicates that the accuracy rate of both phonologically expressed inflections and 'silent' ones differed in attributive and predicative constructions. More precisely, in attributive constructions, [+phon] target items were performed better than [-phon] ones. In contrast, in predicative constructions, [-phon] target items were performed better than [+phon] ones. In addition to this observation, the data also reveal a three-way interaction Syntactic Complexity x Phonological Expression x Group ($F(1.83) = 22.56$; $p = .000$; $\omega^2 = .21$). Both native speakers and L2 learners made fewer writing errors in [-phon] target items in predicative constructions than [+phon] ones. Moreover, in attributive constructions, native speakers made more writing errors in [+phon] target items than in [-phon] target items, while L2 learners made more writing errors in [-phon] target items than in [+phon] ones.

Finally, the data also reveal a two-way interaction between Lexical Category and Phonological Expression ($F(1.83) = 13.12$; $p = .001$; $\omega^2 = .14$). This interaction indicates that the accuracy rate of both phonologically expressed inflections and 'silent' ones differed in adjectives and past participles. Specifically, [+phon] adjectives triggered fewer writing errors than [-phon] ones. Furthermore, [-phon] past participles triggered fewer writing errors than [+phon] past participles.

5.9 Discussion

The results of this experiment show that the lexical category of the target item has an effect on the accuracy of gender marking in written language production. More specifically, adjectives exhibited fewer writing errors than past participles. This finding confirms the first hypothesis. With respect to the syntactic complexity of the agreement construction, my results revealed a main effect indicating that target items in attributive positions triggered fewer writing errors than those in predicative positions. To put it into more detail, this effect holds for both adjectives and past participles. The fact that attributive adjectives yielded fewer errors in gender marking than predicative ones, confirms my second hypothesis. However, attributive past participles also triggered fewer writing errors than predicative ones. This observation, thus, does not confirm my third hypothesis. Based on similar sizes of syntactic structures in which the agreement configurations of attributive and passive past participles are hosted, this hypothesis predicted that these types of past participles would not show differences in the accuracy of written gender marking.

Interestingly, the results do not show a main effect of phonological expression in both native speakers' and L2 learners' written production. This implies that, overall, phonologically expressed gender marking does not lead to fewer writing errors in either native speakers or L2 learners. More interestingly, in predicative constructions, [-phon] target items triggered fewer writing errors than [+phon] ones in both native speakers and L2 learners. Moreover, [+phon] gender marking in past participles yielded more writing errors than [-phon] gender marking, while [+phon] adjectives does lead to fewer writing errors than [-phon] ones. With respect to L2 learners, the data show that, in attributive constructions, [+phon] gender marking yielded fewer writing errors, while native speakers made more errors in [+phon] target items. These findings, thus, only partially confirm the fourth and fifth hypothesis predicting that native speakers make fewer errors in phonologically expressed inflections than in 'silent' ones, while this contrast would not be observed in L2 learners.

The reason for this surprising observation may be related to the fact that, in the L2 classroom, learners received explicit instruction on the phonological expression of gender inflection in French. Moreover, attributive agreement constructions are acquired earlier in second language development (e.g. Pienemann 1989). Therefore, L2 learners might be aware of the phonological content of gender marking in attributive constructions. In native language instruction, however, little explicit attention is paid to the phonological expression of morphology. This may explain why [+phon] gender marking does not lead to fewer writing errors in native language production.

Another explanation for the finding on L2 may be found in a transfer effect from Dutch. More precisely, in Dutch, adjectives and past participles in attributive constructions always exhibit phonologically expressed inflection. The L2 learners under investigation in this study, therefore, might be aware of phonologically expressed gender marking in this particular position.

To put the results into more detail, the fact that, in both native speakers and L2 learners, adjectives elicited fewer writing errors than past participles is in line with the results presented in chapter 4 of this dissertation. The reason for this can be sought in differences in syntactic complexity between the agreement configurations of adjectives and past participles. More specifically, the agreement configuration in which adjective-noun constructions are hosted, is more local than that in which past participle agreement takes place (cf. Kayne 1994). As such, the processing of adjective-noun agreement configurations might engage less computational effort than the processing of past participle agreement ones (Moscato and Rizzi 2014). Consequently, fewer writing errors in gender marking are made in adjective-noun constructions. Another explanation for this contrast can be related to differences in language input. In the corpus by Brunet (2014), for instance, the use of adjectives is more frequent in French than the use of past participles. For native speakers of French, thus, gender marking on adjectives is more frequent than that on past participles. In the L2 classroom, grammar rules related to gender marking on adjectives are instructed earlier than those related to past participles. The frequency contrast between the input of adjectives and past participles, might have an effect on the accuracy of gender marking on these two lexical categories (cf. also Sandra 2010 for a similar finding on verbal morphology in Dutch).

This can also explain the observation that, both in native speakers and in L2 learners, [+phon] adjectives trigger fewer writing errors than [-phon] ones, while this finding does not show up in past participles. As such, both native speakers and L2 learners, are exposed more often to adjectives in spoken language than to past participles. Therefore, these learners may be more aware of the phonological content of gender inflection in adjectives.

Furthermore, the effect of syntactic complexity on written gender marking in adjectives is in line with the results presented in chapter 4 of this dissertation, and (partially) Ågren (2009). More specifically, both native speakers and L2 learners made fewer writing errors in attributive adjectives than predicative ones.

The fact that a similar observation needs to be made for past participles, is surprising. In this respect, the size of the syntactic structure hosting attributive past participle constructions, is similar to that in past participles in a predicate. Furthermore, the length of constituent movement in the syntactic domain is also the same in both constructions. Therefore, the syntactic complexity of these two

types of past participle constructions can be taken as equal, which would have to lead to the same accuracy rate in written gender marking.

The reason for this contradictory finding might be related to the fact that learners considered attributive past participles as attributive (postnominal) adjectives. This error may be caused by a frequency contrast of these lexical categories. More specifically, adjective-noun constructions are more frequent in language production than noun-past participle constructions (cf. Alario, Costa and Caramazza 2002 for frequency effects in the production of adjectival noun phrases in English). Therefore, learners might have taken the attributive past participle as a (postnominal) adjective. Within such a context, postnominal adjectives are claimed to agree very locally with the noun. The processing of this configuration, thus, engages fewer computational resources than past participles in a predicate. As a consequence, past participles in a predicate triggered more writing errors than attributive ones.

In contrast to earlier studies (e.g. Sénéchal 2000; Goldschneider and Dekeyser 2001) on the phonological expression of inflections in relation to language acquisition, the phonological expression of gender marking does not have an effect on written L1 and L2 French. Sénéchal (2000) mainly focused on the phonological expression of morphemes in full nouns and its relation to written language production. The observed use of phonological cues is slightly different in the written production of inflectional morphology. Specifically, the phonological expression of gender marking interacts with other linguistic factors, such as the syntactic complexity of the agreement constructions or the lexical category of the agreeing element. However, no main effect of phonological expression in written inflections was observed. This suggests that, in both native speakers and L2 learners, the effect of phonological expression on written inflections seems to be a post-hoc effect with respect to other linguistic factors (cf. Ågren 2009 for L2). Interestingly, in both attributive and predicative constructions, this post-hoc effect manifests itself differently in adjectives and past participles. The contrasts of the effect of phonological expression might have led to the lack of a main effect of phonological expression. Further research needs to be done in order to investigate why this post-hoc effect differed in adjectives vs. past participles and attributive vs. predicative constructions.

5.10 Conclusion

In this study I conducted an experiment investigating the effect of syntactic complexity and phonological expression on written gender marking in L1 and L2 French. The results showed that the syntactic complexity of the agreement construction and the lexical category of the agreeing element have an effect on the

accuracy of written inflections. More precisely, in both native speakers and L2 learners, attributive adjectives and past participles elicited fewer writing errors than predicative ones. Furthermore, adjectives elicited fewer writing errors than past participles.

Yet, the overall effect of phonological expression did not reach significance. This implies that, in both native speakers and L2 learners, the phonological expression of inflections does only influence written accuracy within certain levels of syntactic complexity and with particular lexical categories. This can be observed through the significant interaction of phonological expression of gender marking with other linguistic factors, such as syntactic complexity or lexical category. I suggested that the effect of phonological expression can be taken as a post-hoc effect in the written production of inflectional morphology by both native speakers and L2 learners of French.

The experiment reported on in this chapter, clearly showed that both the L1 and L2 acquisition of French gender marking are constrained by several linguistic factors, such as the syntactic complexity of sentences or the lexical category of items to be inflected. To face this increased difficulty in acquiring gender marking, digital grammar and spell checkers may be of help to language learners. In the next chapter, I will assess the performance of three digital checkers for French to investigate whether they could be effective in the educational practice.